

- ▶ Turn-mill center
INDEX G220
- ▶ Bevel gear hobbing
- ▶ EWS Weigele, Ugingen



INDEX G220

Successful technology integration

Successful technology integration

EWS Weigele, a renowned manufacturer of static and driven tool systems, manufactures the bevel and spur gears it needs in-house—on a five-axis INDEX G220 turn-mill center. That way, EWS gets the gear assemblies faster than it would from an external supplier, is more flexible in their development, and reduces costs over the long term.

EWS Weigele GmbH & Co. KG in Uhingen (southern Germany) specializes in tool mountings for lathes and turn-mill centers. Due to the varying interfaces from one country to the next and from one manufacturer to another, the product portfolio has grown to some 30,000 solutions over the years. Managing Partner Frank Weigele explains: “We aim to develop and produce suitable static and driven tool systems for nearly all CNC lathes and turn-mill centers. Our offering ranges from products based on defined standards all the way to innovative customized solutions that we also offer in small volumes.”

In addition to the desired variety of products, Frank Weigele mentions the high level of vertical integration as a further corporate principle. EWS masters nearly all machining technologies, even including case hardening, and can there-

fore manufacture nearly all the required parts by itself. That’s quite impressive, considering this amounts to about 65,000 active parts.

After visiting the INDEX factory in Esslingen in 2017, EWS management decided to take gear manufacturing in-house. This is namely where they discovered that INDEX produces spiral bevel gears on its own INDEX turn-mill centers. It was an option that, to the EWS machining pros, seemed a worthwhile way of steering clear from supplier dependency for these types of gear components. “The bevel gear production was impressive. At the time, we already had two INDEX G220 turn-mill centers we used mainly to produce spindles and other accessory parts for driven tools. This included thousands of bevel gear blanks that we subsequently sent out for gear cutting. It therefore made sense to enable such a machine to cut our gears.” >

Technician Norbert Stanzel checks the quality of the bevel gears. This includes visual inspections right next to the machine.



Left: The bevel gears that have just been machined are tested on a gear rolling tester machine alongside the INDEX G220.

(Photos: EWS)



At EWS Weigele, in addition to Managing Partner Frank Weigele (2nd from right), it is mainly Design Engineer Roland Sigel (left) and machining specialist Norbert Stanzel (right) who bear the responsibility. Dr. Volker Sellmeier, Head of Technology Development at INDEX, and his team provide support for technical questions.

Using five-axis turn-mill centers for gear cutting

INDEX has been offering the possibility to integrate additional machining technologies into its turn-mill centers for more than 20 years now. The first time the specialists from Esslingen demonstrated how to use these machines for gear cutting was at EMO 2013. Dr. Volker Sellmeier, Head of Technology Development at INDEX, explains: "After already having successfully integrated grinding processes in our five-axis turn-mill centers, we thought of trying it with gear cutting processes as well—which we finally managed to achieve."

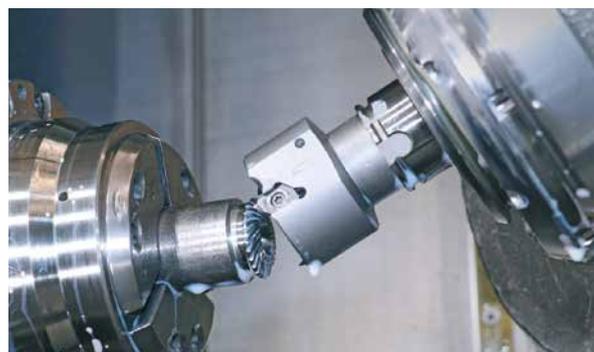
The technological integration was so successful that INDEX now exclusively covers its own demand for bevel gears using an INDEX R300 and both offers and frequently sells gear cutting technologies as a core competency on the

market. Volker Sellmeier goes on: "The INDEX gear-cutting process can be implemented on our R and G-series turn-mill centers. We achieve significant advantages in terms of cycle time, process reliability, and quality on all these machines."

Short learning phase

The EWS management quickly realized the advantages that in-house complete machining of bevel gears would offer. They ordered an additional INDEX G220 and had the technology package for bevel gear cutting implemented. At first, this was uncharted territory for the EWS employees concerned. Since the start of the project, Norbert Stanzel is the lead for bevel gear hobbing. While the experienced machinist had never produced a serration to that point, he found that taking gear manufacturing into his own hands was a fascinating idea: "I immediately signed up for it and am still full of enthusiasm." The initial training at INDEX took less time than expected. He was fit for the job in two weeks instead of the six that had been planned. "The INDEX process makes gear cutting easy," says Stanzel. "The software queries ten parameters in a dialog, such as eccentricity and auxiliary angle. That's all it takes to define the entire bevel gear." The cycle then translates these values into the movements of each axis so that at the end the same relative movements are effected as on a conventional gear cutting machine.

Stanzel's tasks include configuring the gear cutting processes in terms of tension on the main and counter spindles as well as setting up the INDEX G220. As opposed to the conventional gear cutting process chain, in which the workpiece has to be set up on several individual



Bevel gear hobbing: the R and G-series INDEX turn-mill centers are particularly suitable for this gear cutting technology owing to their excellent static, dynamic, and thermal properties.



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We have gained a lot of freedom in gear development and design ever since we started manufacturing our own bevel gears and sprockets.

Roland Sigel works as a design engineer at EWS Weigele

machines, all operations take place on the turn-mill center. The bevel gears are turned, drilled, milled, and finally cut off on a single machine. Moreover, brushes for deburring can also be set up.

Norbert Stanzel subsequently checks the quality of the bevel gears that are produced. This includes visual inspections right next to the machine, as well as detailed checks in the measuring room using a 3D coordinate measuring instrument. "We achieve high levels of precision. The maximum deviation in the topography is about 3 µm. That's sensational."

Advantages for gear development

In addition to the practical work on the machine and with the measuring instrument, there's also a theoretical part, which at EWS is handled by Roland Sigel. The mechanical engineering technician mainly designs driven tools, including many

special versions to customer specifications. His verdict: "We have gained a lot of freedom in gear development and design ever since we started manufacturing our own bevel gears and sprockets. We can now make prototypes, test them, and optimize our driven tools without delays—which ultimately benefits our customers." In his opinion, the INDEX bevel gear hobbing cycle works flawlessly and "we have become very fast in using it. The cycle time for a common bevel gear is only a few minutes in total, knowing that gear cutting generally only takes less than a minute."

The investment for gear cutting on the INDEX G220 is relatively low compared to special machines. Frank Weigele talks of overall costs in the lower seven figure range, which includes the turn-mill center, the technology package with the software, the required measuring equipment, test equipment, etc. "With about 1.5 shift operation, we expect an ROI of less than ten years," reveals Weigele. "However, this does not account for the advantages resulting from in-house production, such as just-in-time deliveries, the ability to do limited production runs, to run trials, etc. In this respect, the INDEX process is very valuable to us." **X**



The bevel gears produced in-house are used in all EWS driven tools. (Photos: EWS)



EWS—Precision meets Motion

The company established in 1960 by Ernst, Gerhard, and Karl Weigele started out as a manufacturer of laboratory equipment and a supplier for hydraulic components. Today, EWS Weigele plays a leading role in the area of tool mountings for CNC lathes and turn-mill centers.

The group employs close to 500 employees. The product range includes about 30,000 different tool systems, from the most standard all the way to customer-focused special developments. The family business carries out most of its production at its headquarters in Uhingen near Stuttgart. Additional production sites are located in the USA and in South Korea. EWS also owns distribution and service subsidiaries in Russia, China, and Turkey.

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